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Effects of specific and non-specific perceived control on blood pressure response in a stressful mental task

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Abstract

Eighty students volunteered to participate in an experiment with the aim of evaluating the impact of the manipulation of self-efficacy and negative incentive values on systolic and diastolic blood pressure, and pulse pressure. The subjects were asked to solve a series of 15 mathematical problems after having been randomly assigned to one of the four experimental conditions that were generated by combining two levels of self-efficacy (high versus low), and two levels of negative incentive value (high versus low), contingent upon failing to properly perform the task. The subjects' perceived competence was also evaluated. The results are consistent with those obtained in prior experiments, and they suggest that: (1) self-efficacy and negative incentive value interact in their effects on blood pressure; (2) the cognitive regulation of systolic and diastolic blood pressure and pulse pressure can be distinguished; (3) the subjects with low self-efficacy and high negative incentive value are the ones who generally experience the greatest activation; and (4) perceived competence does not appear to contribute to the psychophysiological regulation.

Keywords: Self-efficacy; Perceived control; Perceived competence; Negative incentive value; Blood pressure

1. Introduction

Both the present and prior studies of our research group (Sanz and Villamarín, 1997, 2001) are based on Bandura's social cognitive theory (1986). This theory posits that motivational and affective states, in their triple experiential/subjective, physiological and behavioural components, are partially regulated by the interaction between self-efficacy and the outcome expectancies (Bandura, 1982, 1986).

The self-efficacy construct (Bandura, 1977) refers to the competence, to the control that the person expects to exert over the generation and execution of his or her own behaviour. The outcome expectancies construct refers to the anticipated consequences of the behaviour: beliefs about the reinforcement contingencies. Within this construct, several different dimensions can be distinguished: type of consequences, subjective probability that they will be produced contingent upon the behaviour, delay and incentive value.

The common hypothesis in our studies is that the effect of self-efficacy over physiological reactivity in stressful situations, a phenomenon which has been showed in numerous experiments (Bandura et al., 1982, 1985; Wiedenfeld et al., 1990; Gerin et al., 1995, 1996; O'Leary, 1990, 1992; Wright and Dismukes, 1995), is produced especially when the consequences that could result from the action are important for the person (high incentive value). Incentive value is one of the four main dimensions of outcome expectations. (Bandura, 1997; Dawson et al., 2001).

This hypothesis was corroborated in an initial study (Sanz and Villamarín, 1997) in which we used an experimental procedure of reward (money as a reinforcement for success in a linguistic task). The main results of this experiment indicated that self-efficacy influences physiological reactivity, especially when the value of the anticipated consequences is high. We obtained partially similar results in a second study (Sanz and Villamarín, 2001), in which we used

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an experimental paradigm of avoidance (negative incentive value); success in a mental arithmetic task was a requirement to avoid an aversive stimulation. In our view, failing to take into account incentive value could explain the contradictory results about self-efficacy effects on psychophysiological reactivity obtained in some studies (Biran and Wilson, 1981; Barrios, 1983; Feltz, 1982; Feltz and Mugno, 1983). Another aspect of the results from our previous studies is that the two cognitive variables, self-efficacy and incentive value, regulate each physiological system in a different way.

The experiment we present here attempts to test the hypothesis of the interaction between self-efficacy and incentive value on physiological reactivity through an experimental procedure of avoidance similar to that of Sanz and Villamarín (2001), in which we have introduced some methodological changes basically involving the manipulation of both independent variables: negative incentive value and self-efficacy. In the previous study, we used the threat of an electric shock as a negative incentive contingent upon failure to successfully complete the task. Although detailed information was provided on the intensity of pain to be produced, the subjects did not actually receive the electric shock, either before or after the task, which could to some degree make it difficult to assess its aversivity. In contrast, in the present study we have used as a negative incentive a noise that the subjects listened to before carrying out the task; thus, they had an objective referent on the aversivity of the stimulus.

In this same study (Sanz and Villamarín, 2001), we used false feedback on performance achieved in previous training trials in order to manipulate self-efficacy. The use of false feedback is a highly effective method for manipulating self-efficacy, but in certain subjects it can create problems with regard to the credibility of the experimental procedure, especially when the feedback provided contradicts either their perceived competence or their prior experience, making it necessary to screen the experimental sample with the consequent decrease in statistical power (Sanz, 1998). In contrast, in order to generate different degrees of self-efficacy among the subjects, in the present study we set performance challenges (goals) with differing levels of difficulty. This procedure bases its theoretical justification on the fact that self-efficacy depends on both the person's ability and the difficulty of the task (Bandura, 1978); thus, by manipulating the task difficulty we can affect self-efficacy without having to modify perceived ability whatsoever. The reciprocal influence between performance challenges (difficulty of the goal) and self-efficacy has been examined in various studies (Bandura and Cervone, 1983, 1986; Wood and Bandura, 1989; Locke et al., 1984). At the same time, this manipulation procedure, although quite distinct from a theoretical standpoint, is related to studies on active coping within the tradition of classical psychophysiology (such as Manuck et al., 1978).

Self-efficacy and incentive value constitute an essential part of the multidimensional construct of perceived control, within which they are given the common label of specific expectancies. Other variables in this construct are general or non-specific expectancies. Among these, many researchers show an increasing interest about the perceived competence construct (Skinner, 1996; Bandura, 1997; Haidt and Rodin, 1999). This concept, formulated by White (1959) and recovered by Wallston (1992), refers to the overall capacity a person thinks he or she has to succeed in any situation he or she faces. Some studies (Smith et al., 1991; Fernández Castro et al., 1998; Blasco et al., 1999) indicate that perceived competence negatively correlates with anxiety, depression and psychosomatic disorders, and they suggest that having a high level of perceived competence attenuates the effects of stress (assessed through self-report). Although we do not know to what degree this non-specific belief also participates in psychophysiological regulation, in congruence with the results described above it would likely be found that a high level of perceived competence also attenuates psychophysiological activation in situations which induce negative and defensive emotional responses.

In summary, in the present study, we examine the interactive effect of self-efficacy and incentive value (two of the key constructs in perceived control) on blood pressure through an experimental procedure in which we have introduced some methodological refinements with respect to our prior study (Sanz and Villamarín, 2001). Moreover, we attempt to determine the role of unspecified perceived control (perceived competence) on the regulation of this psychophysiological reactivity.

In light of this dual objective, we formulated the following hypotheses:

(1) The effect of self-efficacy on cardiovascular reactivity when carrying out an active coping task will be especially strong when the incentive value is high. More specifically: within high incentive value condition, low self-efficacy subjects will show greater reactivity than high self-efficacy ones.
(2) High perceived competence would attenuate an increase in cardiovascular activity produced while carrying out a stressful task.

2. Method

2.1. Subjects

The sample consisted of 80 volunteers, of which 67 were women and 13 were men, with an average age of 20.3 years. They were chosen among a group of students in their first course of psychology. All of them received standard information, which presented the experiment as a study in cognitive psychology. After recruitment, the volunteers were contacted by telephone in order to set a date and time for the experimental session, as well as for receiving instructions on their behaviour prior to the session. These instructions specified: (1) the need for them to avoid consuming psychoactive substances (tobacco, coffee, cola drinks, tea,